

## **SEMI-AUTOMATIC DISPENSER FOR DISPOSABLE CUPS**

### **Field of Invention**

The present invention refers to a semi-automatic dispensing device for disposable cups, that can be manufactured in different dimensionings, in order to deal with the currently existent different sizes of disposable cups.

### **Description of the Prior Art**

As known by those entitled in this technique, nowadays devices for the above mentioned purpose are already available, but all of them are completely manual and are designed in form of a simple vertical tube, as disclosed in the documents US 4,239,125 - US 5,067,633 - US 5,201,869 - US 5,222,628 - US 5,709,316 - US 6,325,243 and US 6,789,697. According to these documents, almost all these devices comprise a body exhibiting a tubular shape which, actually, is a compartment for a certain quantity of cups, which remain one inside the others, forming a vertical stack of cups turned with their mouths facing downwards or not, where the first cup remains partially and sufficiently exposed, so that it can be pulled down by the user, and, together with a system of clamps, this bottom cup is released, whilst the others remain confined in the mentioned tubular compartment.

On the other hand, other more complex cups dispensing devices are available, so as disclosed in the documents US 6,398,072 - US 6,474,503 - US 6,772,908 and US 6,427,868. In these cases, beyond the tubular compartment for the cups, each device offers a different manner in which the cup can be pulled outside, whilst the others remain in the inner section of the device.

There is no doubt that the above mentioned devices enable a certain quantity of cups to be maintained available for the user, but they exhibit some restrictions and inconveniences. First of all, their operational system so as the compartment where the cups are stored are half-open, and the cups remain exposed to the conditions of the environment. Consequently, this

fact impairs the adequate hygienic aspect of the above mentioned cups as they are maintained available for the users. Besides, in certain situations the ensemble can be considered inadequate, mainly if they are used in polluted environments or places exhibiting great quantity of suspended particles, such as industrial environments. In these situations, the usual devices can not be considered adequate, since they do not offer enough protection for the cups. In addition, in the conventional models, at the moment one cup is withdrawn, the others are maintained in position only due to a system of clamps. This system can not be considered efficient, because frequently when the user tries to withdraw only one cup, several of them - or at least two - come out in an undesired manner. This is caused by the fact of the cups being fitted into each other with a certain pressure, and the system of clamps does not previously separate the cup being withdrawn from the next cup.

### **Objectives of the Invention**

The present semi-automatic dispenser was created to solve the above mentioned inconveniences. Its first preferred concretion has as its main goal the characterization of a completely different device in comparison to the ones currently known. In this way, it exhibits a body having the shape of a semi-circular box with an upper compartment for the cups and a bottom reception for the dispensed cup. In the inner section of the mentioned box is located a diaphragm mechanism also exhibiting semi-circular shape, whose manual operation enables the dispensing of one cup at a time. The referred device is completely different when compared to the usual devices used for the same purpose, not only referring to its operation, but also referring to the way the cups are stored. These are withdrawn one by one by means of the mentioned semi-automatic mechanism, specially designed to remain completely built-in. This operation is performed through an handle having the shape of a lever interconnected with the mentioned internal diaphragm. The sliding parts enable the cup to be dispensed to be previously separated from the others. This cup is then dispensed in the bottom part of the device. When

this operation is completed, the passage is shut, maintaining the whole ensemble adequately tight. Hence, a significant advantage is offered, since the compartment or drawer containing the disposable cups remains completely closed. Consequently, the ensemble can be used in any location.

5 Another advantage is the fact that the system comprising the sliding diaphragm is designed to perform a sequence of angular movements, where: a) the first bottom cup will be completely separated from the subsequent cup; b) the stack of cups located above the first cup will remain firmly leaned, and only one cup - or the first bottom cup - will be released; c)  
10 the first cup, separated from the others, will be released through free fall and will remain positioned so that the user can pick it up easily; and d) that diaphragm will shut again the opening through which the cup was released, maintaining the inner section of the device completely isolated from the environment, avoiding inclusively the penetration of insects.

15 Although the above mentioned device exhibits an efficient operation, it was noted that its body exhibiting semi-circular shape, and also the diaphragm mechanism equally semi-circular, could be considerably improved. Due to the fact that in its preferred concretion, both body and diaphragm exhibit a semi-circular shape. This fact demands numberless  
20 special constructive details referring to the moving parts, mainly an articulation point in form of shaft for the mentioned diaphragm. Eventually, this shaft can be subjected to wearing or material fatigue.

On the other hand, the semi-circular geometry adopted for the above mentioned device, demands a diaphragm exhibiting constructive details  
25 including a great number of curved parts, mainly referring to the horseshoe shaped part, which is responsible for the separation of the first cup from the others. This part, as already mentioned, exhibits an horseshoe shape, and its side branches are curved so as to follow the semi-circular sliding movement. Consequently, this configuration impairs the component manufacturing.

30 With the purpose of offering a more simple device, both

referring to the constructive and operational aspects, a constructive variation - or a second preferred concretion for the ensemble - was created. The same operational concept of the previous version was maintained, but a different assembling geometry was adopted, both referring the body and the diaphragm system. The body exhibits the shape of a rectangular box with small height. In its inner section slides a diaphragm exhibiting similar shape. In other words, exhibiting the shape of a simple rectangular plate, whose movement, unlike the previous one, is rectilinear. Beyond eliminating the use of a shaft, the terminals or side branches of this horseshoe shaped part are straight and parallel one in relation to the other, resulting in a more efficient configuration for the ensemble operation. As already mentioned, the diaphragm is a rectangular plate and exhibits a blind extremity over which the stack of cups remains leaned with their mouths facing downwards. The other extremity of the mentioned plate is hollowed out by an opening, which is contoured by the horseshoe shaped part. In this condition, when the mentioned plate is moved until the end of its travel, this opening is positioned exactly under the stack of cups. However, the horseshoe shaped part separates only the first cup from the others. So, the first cup is released by free fall and remains positioned to be withdrawn by the user, whilst the stack of cups remains leaned over the horseshoe shaped part. When the diaphragm is no longer operated, the strength of the spring makes it return automatically, and its blind section is positioned under the stack of cups. So, the complete device remains once more closed and ready for a new operation.

Hence, in this other preferred concretion, the modifications were created so that the mobile parts can operate through straight movements. Consequently, the ensemble efficiency is considerably improved, mainly due to the fact that the mentioned diaphragm does not use one point as shaft. The straight movements request only straight guides or fittings. In this way, possible points which could eventually exhibit easy wearing were eliminated.

### **Description of the Drawings**



For a better comprehension of the present invention, below can be found a detailed description including references to the attached drawings, where:

**FIGURE 1** represents a view in perspective showing the assembled ensemble from an upper angle;

**FIGURE 2** represents another view in perspective of the assembled ensemble, but seen from a bottom angle;

**FIGURE 3** illustrates an exploded perspective view, showing each component of the ensemble seen from a superior angle;

**FIGURE 4** illustrates another exploded perspective view, but showing each component from a bottom angle;

**FIGURE 5** shows a perspective view and cuttings detailing one part exhibiting special construction in horseshoe shape;

**FIGURE 6** represents the side view cut illustrating the operation of the ensemble.

**FIGURE 7** represents a perspective view showing the assembled ensemble from an upper angle, according to the other preferred construction;

**FIGURE 8** illustrates an exploded perspective view of the ensemble represented in the previous figure, detaching each component from an upper angle;

**FIGURE 9** is another exploded perspective view, but showing each component from a bottom angle;

**FIGURE 10** illustrates a partial view in cross section, showing the internal diaphragm mechanism, according to a second preferred concretion.

**FIGURE 11** shows a perspective only of the horseshoe shaped part used in the second preferred concretion;

**FIGURE 12** shows a view of the cutting A-A indicated in the previous figure;

**FIGURE 13** shows a perspective only from the horseshoe shaped part, detaching a constructive variation;

**FIGURE 14** shows a view of the cutting B-B indicated in the previous figure;

5 **FIGURE 15** represents a side view illustrating the operation of the ensemble and, in this case, detaching the movement performed by the dispensed cup according to the second preferred concretion;

10 **FIGURE 16** shows a side longitudinal cut view, detaching the device in inactivity - or not operated - referring to the second preferred concretion; and

**FIGURE 17** is a view equal to the previous one, but, in this case the device is operated to dispense one cup.

#### **Detailed description of the invention**

15 According to the illustrated in figures 1 and 2, the present invention - in its first preferred concretion - comprises a semi-automatic dispensing mechanism (1), defined as a box exhibiting an half moon or semi-circular shape (2), whose straight section is facing the rear side, where it includes a fastening plate (3) for the ensemble in an adequate place, whilst the curved section is facing the front. Its superior section includes a vertically  
20 assembled tubular drawer (4), which should be preferably transparent, with a top lid (5). This configures the compartment for several common disposable cups, arranged with their mouths facing downwards. The bottom of this compartment is axially aligned with another ordinarily tubular and vertical section (6), which constitutes the exit for the cups to be dispensed by the  
25 semi-automatic dispensing device (1).

The dispensing device (1), as already mentioned, comprises one box exhibiting an half moon or semi-circular shape (2). As represented in detail in figures 3 and 4, this box includes an horizontally plane superior wall (7), semi-circular, contoured by a substantially short vertical wall (8), under  
30 which fits itself another plane section comprised of a plate exhibiting an half

moon shape (9), which by its turn, closes the semi-circular box (2). Above this mentioned plate (9), exists another sliding diaphragm-plate (10) which, at its rear edge, includes an articulation bolt (11), and at its front edge exhibits an extension which configures the digital handle (12), radially projected to the outside through a slot (13) formed by a cutting in the wall (8). This cutting exhibits sufficient extension so that the mentioned diaphragm-plate (10) can be moved in an angular way from one side to the other, establishing or not the alignment between its circular opening (14) and two other circular openings (15) and (16), that exist in the wall (7) and in the closure section (9). These are respectively aligned with the tubular compartment (4) and the tubular exit (6). The alignment of the opening (14) is established by the slot (13), whose length is also sufficient for the diaphragm-plate (10) to be displaced so that its blind section (17) can be placed between both circular openings (15) and (16). Over the diaphragm-plate (10) is fastened a part exhibiting an horseshoe shape (18), whose open ends or extremities - besides having their heights funnel-shaped - face the blind section (17), while in the opposite side, great part of its extension contours the mentioned opening (14). As illustrated in figure 5, this mentioned horseshoe (18) exhibits a special cross-section, in detail, the whole extension of its internal border is contoured by a tread or progressive advanced border (19), which is responsible for the separation of the cup to be dispensed in the inner side of the tubular section (6). This tubular section (6) exhibits the shape of an half tube, whose bottom end is narrower, and over which exists median peg (20).

As illustrated in figure 6, the operation of the ensemble is really simple, and the dotted lines represent the movement of the dispensed cup. Before describing this details, it is possible to observe that the cups (C) are arranged with their openings facing downwards in the inner side of the compartment (4). In a first condition, showed in the detail of figure 6, the diaphragm-plate (10) is displaced so that its blind section (17) is positioned over the opening (16). Consequently, the stack of cups remains leaned against

this mentioned blind section (17) of the plate (10), being hindered from moving down. To dispense one cup, the mentioned diaphragm-plate (10) is displaced through its digital handle (12) until its opening (14) becomes axially aligned with the opening (16). This movement is limited by certain construction details, mainly the slot (13). During this sliding movement of the diaphragm-plate (10), the horseshoe shaped part (18) promotes the selection or simply separates the first bottom cup from the others. In other words, the border (19) fits itself between the first and second cup from the bottom to the top, forcing the first cup so that it releases itself from the cup immediately above. In this condition, the cups - or the stack of cups - remain leaned against the thread or border (19), whilst only the first cup is positioned below the mentioned border. When the alignment between the holes (14) and (16) is completed, the first cup is released sliding down through the length of part (6) by simple free fall, descending with its mouth downwards. But, as it touches the peg (20), it tends to turn to the outside, in a 180° rotation. This occurs due to the conic shape of the mentioned cup, whose mouth exhibits a greater diameter. The cup remains inside the part (6), whose bottom extremity exhibits a slight funneling, sufficient to retain the mentioned cup in the upright position, so that the user can pick it up already in the usage position.

According to figures 3 and 4, in an adequate point of the diaphragm-plate (10) and the inner side of the box (2) it is possible to include an adequate spring (21), which would maintain the mentioned diaphragm-plate (10) strained, so that it can be secured in the position with its blind section (17) between the openings (15-16). Consequently, in this position, the complete compartment (4) remains adequately closed, avoiding de penetration of insects and impurities.

Figures 7 to 17 show the second preferred concretion for the present dispenser. According to figures 7, 8 and 9, it is possible to observe that this device is comprised of:

a) a semi-automatic dispensing mechanism (50), defined as a



box exhibiting parallelepipedic shape (51) and reduced height, whose rear section includes fastening means (52) for the ensemble in appropriate place;

b) a tubular drawer (53), preferably transparent, with a top lid (54), which configures the compartment for several usual disposable cups (C),  
5 arranged in form of a stack with their mouths facing downwards;

c) the mentioned box (51) having an upper wall (55) exhibiting a central opening (56), whose upper side includes a fitting and fastening collar (57) for the corresponding extremity of the drawer (53), whilst the bottom side exhibits a semi-circular collar (58), which corresponds to the axial  
10 passage (P) for the cups (C) to be dispensed;

d) the bottom section of the box (51) is closed by a rectangular lid (59);

e) the rectangular lid (59) exhibits a circular central opening (60). One side of this opening is axially aligned with the upper opening (56),  
15 whilst the bottom side includes a collar (61) forming the continuity of the passage (P) - or exit - for the cups to be dispensed by the semi-automatic dispensing device (1);

f) a receiving drawer (62) for the dispensed cups (C) exhibiting an ordinary tubular shape, whose upper extremity is connected to the collar  
20 (61);

g) a diaphragm (63) assembled in a sliding way in the inner section of the box (51). This diaphragm is formed by a plate (64) in which one extremity exhibits a blind section (65), whilst in the opposite extremity exhibits a section with an opening (66), whose diameter is compatible with  
25 the openings (56-60) and with the mouth diameter of the cup (C) to be dispensed. The mentioned blind section (65) is cooperative so that it can be positioned in two ways, outside or between the two openings (56-60). In the second position it actuates as closing and support for the stack of cups (C) to be dispensed, whilst the hollowed out section (66) can also be positioned in  
30 two ways, outside or between the openings (56,60). In the second position

occurs a perfect axial alignment between the openings (56), (60) and (66), so that the cup (C) to be dispensed is able to pass through the inner section of the receiving drawer (62);

h) an horseshoe shaped part (67) is fitted over the diaphragm (63). A portion of this horseshoe contours the opening (66) in a relation opposed to the collar (58), with which it combines to form a circular passage section (P) for the cup to be dispensed. The mentioned horseshoe exhibits cooperative internal means (68) - also shown in figure 10 - that, concomitantly, separate the first bottom cup (C1) to be dispensed while retaining the other cups (C2) when the diaphragm (63) is moved aligning the openings (56), (60) and (66);

According to the amplified detail in figure 9, the bottom edges from the front (69) and rear (70) walls of the box (51) exhibit internal steps (71-72). The first one is responsible for the fitting and fastening of the lid (59) and the second forms the slider for the diaphragm (63).

The diaphragm (63), or its plate (64), exhibits a front extension configuring an handle (73), which trespasses a longitudinal slot (74) in the front wall (69). It is sufficiently exposed so that the mentioned diaphragm can be displaced in both directions, and along the sliders or step (72).

Usually the diaphragm (63) is maintained strained with its blind section (65) between the openings (56) and (60). This is achieved by two springs (75), one at each side. These springs have one of their extremities connected to pins (76) in the plate (64), whilst the opposite extremities are connected to other pins (77) in the inner section of the lid (59).

According to the illustrated in figures 11 and 12, in a first constructive version, the horseshoe shaped part (67) has its branches (78) parallel one to the other and coinciding with the curved or semi-circular section (79). This section and the branches (78) have coplanar bottom faces. However, in the upper section, the parallel branches (78) exhibit decreasing inclined faces (80). In the inner face (81) of the mentioned horseshoe shaped

part (67) are developed the means (68) for cups separation. These means exhibit the shape of a rim or rib having an horizontal section (82) which extends itself through the curve (79) and an inclined section (83) which accompanies the face (80) inclination, so that the free extremities of the sections (83) can remain aligned enabling them to penetrate as a fork in the space (E) surrounding the rounded borders between the first cup (C1) and the second cup (C2). The diaphragm (63) is moved in direction of the arrow (S), where the inclination of the sections (83) is sufficient to separate the cup (C1) from the other cups (C2) and liberate the first cup through the passage (P) whilst the others remain leaned against the rim (68).

The distance (d) between the free extremities of the sections (78) or terminals of the section (83) of the rim (68) is slightly smaller than the cups (C) diameter. The cup has its circular wall slightly pressed, sufficient to promote its displacement in relation to the next cup, favoring its release through free fall through the passage (P).

In relation to figures 13 and 14, according to a constructive variation, the terminals (78) of the horseshoe shaped part (67) exhibit their upper face (84) parallel to the bottom face, the other constructive details remaining unchanged. In this case, the height (y) renders only to guide a greater number of cups (C) during diaphragm operation (63).

According to the illustrated in figure 15, the upper extremity of the drawer (62) exhibits a tubular shape (85) to be connect to the collar (61). Under this section (85), it exhibits a longitudinal cut having semi-circular shape, but with a sufficient radius that enables the greater diameter (mouth) of the cup (C) to be maintained imprisoned, whilst its smaller diameter (bottom) is launched to the outside. This occurs when the mentioned cup touches a median peg (86) that can be found in the inner section of the drawer (62), where the mentioned cup suffers a 180° rotation and is maintained in this position in the bottom extremity of the mentioned drawer (62). With this purpose, the bottom extremity of the drawer exhibits a slightly smaller

diameter than the greater diameter of the cup (C), so that the cup remains with its mouth slightly fastened by this bottom extremity of the drawer (62), whilst the rest of its body remains exposed, so to be easily removed by the user.

Eventually the holder (52) can be integrated with a pedestal or  
5 base (not illustrated), enabling the ensemble to be placed over any plane instead of being fastened to a wall. However, this and other modifications will not interfere in the basic configuration of the ensemble.

The operation of the device according to the second preferred  
concretion is equally simple, according to the illustrated in figures 15, 16 and  
10 17, where the dotted lines represent the movement of the dispensed cup. But before describing this details, it is possible to observe that a stack of cups is arranged with their mouths facing downwards in the inner section of the compartment (53). In a first condition, illustrated in figure 10, the diaphragm plate (63) is displaced so that its blind section (65) is positioned over the  
15 opening (60). Consequently, the stack of cups (C) remains leaned against this mentioned blind section (65) of the plate (64), being hindered from moving down. To dispense one cup, the mentioned diaphragm plate (63-64) is displaced through its digital handle (73) to overcome the pressure of the  
springs (75) until its opening (66) becomes axially aligned with the opening  
20 (60). This movement is limited by certain construction details, mainly the slot (74). During this sliding movement of the diaphragm-plate (63), this horseshoe shaped part (67) promotes the selection or simply separates the first bottom cup (C1) from the others. In other words, the rim (68) fits itself between the first (C1) and second cup (C2) from the bottom to the top,  
25 forcing the first cup so that it releases itself from the cup immediately above (C2). In this condition, the stack of cups remains leaned against the rim (68), whilst only the first cup is positioned bellow the mentioned border (figure 17). But, when the alignment between the openings (66) and (60) is completed, the first cup (C1) is released to slide down and through the length  
30 of the drawer (62) by simple free fall, descending with its mouth downwards.



But (figure 15) as it touches the peg (86), it tends to turn to the outside, making a 180° turn. This occurs due to the conic shape of the mentioned cup. Its mouth, exhibiting a greater diameter, remains inside the part (62), whose inferior extremity exhibits a slight funneling, sufficient to retain the  
5 mentioned cup in the upright position, so that the user can pick it up already in the usage position. In this moment that lever (73) is not manually operated anymore and, therefore, the springs (75) make the diaphragm (63) return to its original position, the one illustrated in figure 16. In this position the complete  
10 inner section of the device remains adequately closed, avoiding the penetration of insects and dust. And the device will be ready for a new operation.